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(54) Title: CASSETTE UNIT FOR PRINTING QUASI RANDOM NUMBERS		
(57) Abstract		
<p>A method for printing quasi-random number tables on cylindrical objects. A quasi random number printing unit is inserted in a blanket cylinder (1) of an object decorator press. An impression cylinder (8) disposed within the printing unit is advanced by a cam drive, thereby advancing a plurality of belts (10) entrained about the impression cylinder (8). Each belt (10) has a different length and has a plurality of printing plates (27) on its outer surface. As the belts (10) are advanced, a series of printing plates (27) are exposed to an inking unit. Ink is applied from the inking unit to the printing plates (27), and from the plates (27) to the surface of a cylindrical object.</p>		

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-CASSETTE UNIT FOR PRINTING QUASI RANDOM NUMBERS-

BACKGROUND OF THE INVENTION

10 This is a continuation-in-part of U.S. Patent Application Number 142,155, filed January 11, 1988, entitled METHOD AND APPARATUS FOR PRINTING OF QUASI RANDOM NUMBER TABLES ON CYLINDRICAL OBJECTS.

15

1. FIELD OF THE PRESENT INVENTION

This invention relates to a cassette unit for printing quasi random numbers on cylindrical objects and has been devised particularly though not 20 solely for printing random number tables for games of chance onto cylindrical objects such as drink cans.

2. BACKGROUND ART

Drink cans and other cylindrical objects such as paper cups, cardboard 25 tubes, etc. are commonly printed with multiple colour graphics on cylindrical container decorating presses. With printing of this type it has hitherto proven impossible to print quasi random number tables of the type used in games of chance and utilized for promotional purposes onto the surface of the can or other cylindrical object. Various ways of printing 30 random numbers onto cans have hitherto been incompatible with the cylindrical container decorating press and random numbers have had to be printed onto the can in a separate printing operation which is of course time consuming and expensive. To overcome this problem I have devised a way of utilizing a belt type apparatus for printing quasi random number tables.

SUMMARY OF THE PRESENT INVENTION

The present invention therefore provides apparatus for printing quasi random numbers on cylindrical objects, comprising a cylindrical 5 container decorating printing press having a blanket cylinder incorporating a plurality of segments on which rubber offset blankets are mounted, characterized by the provision of a random number printing unit located between two segments within the blanket cylinder and arranged with the imprinting face of the unit aligned with the printing face of the adjacent 10 blankets. Preferably a plurality of printing units are provided, one located between each pair of adjacent segments.

Preferably, each random number printing unit comprises a unit comprising a plurality of unequal length belts entrained about an 15 impression cylinder and an idler cylinder, each belt having a length which is a multiple of a basic pitch value or gradient, and having a plurality of printing plates adhered to its outer surface, the impression cylinder being driven by a cam to advance the belts one gradient between each printing pass.

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The present invention provides a cassette unit for use with a can decorator press. The cassette unit includes a plurality of different length belts, the belts being multiples of the pitch gradient of each belt, for printing quasi random numbers, symbols and characters on cans. The cassette unit is 25 used as a portable printing unit that can be configured separately from the can decorator press but used in conjunction with the press as required.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a diagrammatic view of the blanket cylinder of a conventional cylindrical container decorating press.

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Figure 2 is a fragmented view to an enlarged scale of a portion of the blanket cylinder shown in Figure 1 incorporating a diagrammatic representation of a random number printing unit according to the invention.

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Figure 3 is an end view of the random number printing unit incorporated into the blanket cylinder.

Figure 4 is an end view of an alternate embodiment of the present 15 invention.

Figure 5 is a perspective view of a blanket segment of Figure 4.

Figure 6 is a block diagram of a reverse vending machine.

20

Figure 7 is a side view of the printing cassette of the present invention.

Figure 8 is a cross sectional view of the cassette of Figure 7 taken along 25 section line 8-8.

Figure 9 is a cross sectional view of the cassette of Figure 7 taken along section line 9-9.

Figures 10A-10G illustrate the festoon roller arrangement for belts B1-B7 of the cassette of Figure 7.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

A typical cylindrical container decorating press has a blanket cylinder (1) of the type shown in Figures 1 and 2 which has a number of blanket 5 segments (2) (typically eight segments as shown in the drawing) on which a rubber offset blanket (3) is mounted. The construction of the offset blanket can be more clearly seen in Figure 2 where it can be seen that the blanket (3) is tensioned over each segment (2) by way of tensioning rollers (4) and pawls (5) to secure the blanket in the desired place over the periphery of the 10 segment.

In a typical can printing process, as each offset blanket passes each inking unit a colour is applied on to the rubber offset blanket. Eventually up to six colours are applied to each blanket. Depending on the precise 15 design of the cylindrical container decorating press, the container to be printed is rotated past the blanket cylinder and all six colours are applied to the container as it is rolled against the blanket. The container is subsequently varnished and dried and the finished product then leaves the cylindrical container decorating press.

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The blanket cylinder is typically constructed of cast steel and is basically hollow except for reinforcing splines (6).

According to the invention one or more belt type random number 25 printing units of the type described in my co-pending patent application No. 133,666 filed December 16, 1987 and entitled METHOD AND APPARATUS FOR PRINTING QUASI RANDOM NUMBERS IN A FLEXOGRAPHIC PRESS are inserted into the blanket cylinder between the reinforcing splines (6) in the position shown diagrammatically at (7). Although only one

random number printing unit has been shown in Figure 2, typically there would be one unit provided between each pair of splines (6) arranged to imprint a random number between each pair of adjacent blankets (3).

5 The basic configuration of the random number printing unit will now be described with reference to Figure 3. The printing unit comprises an elongate impression cylinder (8) and an elongate idler cylinder (9) about which a plurality of belts (10) are entrained. Each belt has a different length which is a multiple of a basic pitch value or gradient and has a plurality of 10 printing plates adhered to its outer surface. Each belt is maintained in tension by its own tensioning roller (11), and the tensioning rollers are of course positioned in different locations due to the different length of the belts (10).

15 The belts have internal transverse teeth incorporated into the belt design, and the impression roller (8) has geared teeth thereon which mesh with the internal teeth on the belts and keep all of the belts in register as they pass over the impression roller (8).

20 The impression roller (8) is driven by a cam drive which rotates the roller, and hence advances each of the belts, by the gradient length or value between each printing operation. The plates attached to the belts typically incorporate number segments which continuously change in register with one another, so that the entire number printed by each segment is 25 constantly changing in a quasi random fashion.

The ink application system of the cylindrical container decorating press is utilized to apply ink via an offset plate to the flexographic plates on the printing belts (10), which in turn applies the ink to the container rolled

against the blankets (3) as the container continues to roll over the surface of the impression cylinder at position (12) (Figure 3).

After one can or other cylindrical object being printed has passed over 5 the impression cylinder, the cylinder is rotated by a cam through one gradient and a new combination of numbers is then presented ready to be inked and for the cycle to be repeated. There are eight different random number printing units arrayed around the blanket cylinder and each unit will print approximately thirty-one million different combinations of game 10 components before repeating a combination.

In this manner an apparatus is provided which enables random numbers to be printed on to cans or other cylindrical objects for the playing of games of chance in a simple and yet effective manner.

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An alternate embodiment of the printing unit of the present invention is illustrated in Figures 4 and 5: Referring first to Figure 4, a side view of the printing unit is illustrated. In this embodiment, a single belt 21 is entrained about an idle cylinder 9, a tensioning roller 11 and a hexagonal 20 impression cylinder 22. The belt assembly is contained within a housing 25, which can be moved up and down within the opening 24 in the printing press. The entire housing and belt assembly is referred to herein as a cassette unit. The up/down motion of the cassette unit permits the hexagonal printing roller 32 to be turned for advancing the belt 21 to the next printing 25 image. In this embodiment, each cassette unit contains a single impression belt. A plurality of cassette units having belts of different lengths may be disposed about the printing press as desired.

Referring now to Figure 5, a perspective view of the printing belt 21 is shown. The belt 21 includes a plurality of sections 27 registered with a face 28 of the printing roller 22. The belt includes a plurality of openings 28 for engaging pins or sprockets on tensioning roller 11. The belt 21 may contain 5 number tables as described above or any decorative image desired. The use of this cassette unit, which may be removably coupled to a standard can decorator press, permits the easy addition of images to a can without retooling the blanket segments. In addition, the cassette unit is easily removable and the belt 21 easily changed to allow great flexibility in 10 providing images on cans and other cylindrical objects.

The present invention has particular application to the printing of promotional items such as games, collectable figures, celebrities, etc. onto cans and other cylindrical objects. One particular application of the present 15 invention is with the use of thermochromic ink, i.e. ink whose colour is temperature dependent. For example, a promotional game or picture could be printed onto a cup or can with thermochromic ink so that when a chilled drink was poured into the cup or the can was chilled, a prize indication or other item would appear.

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Similarly, the present invention is particularly applicable to a game relying on the quasi-random nature of the number tables printed by the assemblies of the present invention. For example, each can is printed with a quasi-random number and/or bar code. A sponsoring company could select 25 "winning" numbers periodically and could give a prize to anyone turning in the can having the correct number. Such promotions could be particularly useful in improving the ecology as an incentive to users of canned goods to turn them into recycling centers.

CAN PRINTING GAME

The apparatus of the present invention has particular application to recycleable cans such as soft drink cans, etc. Certain states now require that 5 deposits be paid by a consumer when purchasing goods stored in recycleable cans. The deposit is returned to the consumer when empty cans are brought back to the point of purchase or to a recycling center. The amount of the deposit is designed to encourage the original purchaser to return the can for recycling. It also acts as an incentive for others to collect recycleable cans to 10 submit for deposit money.

The present invention proposes an additional incentive for both purchase and recycling of recycleable cans. The present invention 15 contemplates the printing of pseudo-random numbers, symbols or other indications onto cans. In the preferred embodiment of the present invention, a random or pseudo-random number is included as part of the universal product code (UPC). The UPC is a series of lines or bars printed on the can representing a number which is otherwise unreadable to a member of the general public. The UPC must be scanned and decoded in order to 20 convey information.

The present invention contemplates self service recycling centers utilizing what is commonly referred to as a "reverse vending machine". A reverse vending machine accepts empty cans and returns deposit money to 25 the user. One such reverse vending machine is manufactured by Invipco and is shown in general form in figure 6. The reverse vending machine 60 includes an opening 64 in a housing 66 for insertion of a can 63. The optical scanning Unit 61 is used to scan the UPC of the can. In some instances, processing means are included to track the number of cans from each

manufacturer inserted into the reverse vending machine so that accurate allocations of deposit costs may be maintained. The optical scanner 61 may be of any suitable type in use at the present time. The operation of the optical scanning device 61 is not discussed in detail here since such devices 5 are well known in the art. A printer 62 is coupled to the scanning unit 61. The printer 62 prints out a tape 65 providing the user with the number of cans deposited, as well as a list of the game numbers contained in the UPC of the cans inserted. The printout tape 65 is provided to the user for his records.

Periodically, a winning number or numbers are drawn or otherwise determined by a sponsoring company. Prizes are awarded to holders of receipts indicating that they returned a can with the "winning" number to a reverse vending machine or recycling center. One advantage of including 15 the game numbers as part of the UPC is that they are otherwise unreadable, so as to discourage people from discarding cans that do not contain a winning number. Consumers are encouraged to turn in all cans to learn if a can includes a winning number.

20 In other instances, the winning combination could be determined in advance, and a pseudo-random distribution of numbers is utilized so that only a certain number of cans will contain winning numbers. This is similar to well known "lottery" type games in which a large number of plays contain numbers for a small prize amount with decreasing numbers of plays 25 containing numbers for larger prize amounts. Although the present invention has been described in terms of cans, it has equal application to any cylindrical items.

CASSETTE UNIT

A cassette unit for printing quasi random sequences as part of a can decorator press is illustrated in Figure 10. The cassette is essentially a portable printing unit that can be configured separately and used with a can 5 decorator press, as required. The unit can be placed in the can decorator press and used for a printing run of any length. The present invention is especially useful for short runs. For example, it may be desired to print a large number of cans with small subsets of the run having celebrity likenesses applied. This is difficult to achieve in the prior art. However, 10 with the present invention, a number of cassette units can be prepared, each having a number of celebrity likenesses for printing on the cans and selectively used in the can decorator press so that the desired goal can be achieved.

15 Referring to Figure 10, the cassette unit 100 comprises a housing 101 having mounted therein a plurality of festoon rollers 102-107. Festoon rollers 102-107 are for receiving a plurality of printing belts such as belt B1. The printing belts and their relationship to the festoon rollers are shown in detail in Figures 10A-10G.

20

A roller clutch assembly is used to position the cassette during operation. A rocker plate 115 is pivotally mounted to the housing 101 at pivot point 110. The rocker plate 115 is coupled to rocker arm assembly 114 at pivot point 109. The other end of rocker arm 115 is mounted to cam plate 25 142 at point 108. Tensioning forms, such as forms 111 and 112 of Figure 7 are mounted to the housing 101 at locations 113A and 113B. The tensioning forms 132 and 133 receive and are intertwined with the printing belts, such as belt B7. The tensioning forms provide tension for different lengths of the belts and are, therefore, of different dimensions themselves.

Figure 8 is a cross sectional view of the cassette unit of Figure 7 taken along section line 8-8. The housing 101 is comprised of left and right sections 101A and 101B. Roller 107 is mounted in the housing and includes 5 a first smooth section 125. Roller 107 also includes a plurality of grooves 124 for receiving flexographic printing belts. Roller 103 is also mounted in the housing 101 and includes a substantially smooth area 116 and a second section 117 including groove 118 for receiving a flexographic belt.

10 Figure 9 is a cross sectional view of the cassette unit of Figure 7 taken along section line 9-9. Figure 9 shows rollers 102, 104 and 105 mounted in the housing between plates 101A and 101B. Rocker plate 115 is also coupled at roller 102. The rocker arm 114 is coupled at point 109 to the rocker plate 115. The arm 114 includes two female sections, 120 and 122 for receiving a 15 male rod 121 which allows length adjustment of the rocker arm. The male rod 121 is coupled to the female sections 120 and 122 by nuts 123.

Roller 102 includes a plurality of receiving grooves 118 for receiving flexographic printing belts. Roller 104, in the preferred embodiment of the 20 present invention, receives two printing belts and provides receiving grooves 119 for receiving those belts. If desired, all rollers could have receiving grooves for any number of belts without departing from the scope of the present invention. In some cases, it is desirable to provide only those receiving grooves as necessary.

Figures 10A-10F illustrate the festoon arrangement for each of seven belts utilized in the example of the preferred embodiment of the present invention. Although seven belts are used by way of example, any number of belts can be utilized without departing from the scope of the present

invention. In addition, this particular festoon arrangement is described by way of example only. Different length belts may require different festooning arrangements. In addition, a different number of festoon rollers may be utilized.

5

Referring to Figure 10A, the festoon arrangement for belt B1 is illustrated. The belt is entwined about a number of the festoon rollers and a tensioning plate 126. In the preferred embodiment of the present invention, the tensioning plate is comprised of nylon. The belt B1 contacts the 10 tensioning plate at anvil 127 and outer radius 140. Outer radius 141 is adjusted to receive different length belts to provide proper tensioning. The anvil 127 includes a printing surface 140 where the image on the flexographic belt B1 is transferred to a cylindrical object such as a can in the can printing press. The belt B1 in the preferred embodiment of the present 15 invention is entwined about festoon rollers 106, 103, 102 and 107 and does not contact rollers 104 and 105. The belts move in a counter clockwise direction in the preferred embodiment of the present invention and are moved one gradient each cycle.

20 Belt B2, illustrated in Figure 10B, is entwined about the same rollers, 102, 103, 106 and 107 as belt B1. However, the tensioning plate 128 for belt B2 has a greater outer radius 141 than the plate of belt B1. Therefore, belt B2 is longer than belt B1. Referring now to Figure 10C, belt B3 is entwined under roller 107, over roller 102, and around the outside of rollers 104 and 106.

25 The belt does not contact rollers 103 and 105.

Belt B4 of Figure 10D passes under roller 107 and around the outside of rollers 102, 105 and 106. The belt does not touch rollers 103 and 104. Belt B5 passes under roller 107, over roller 102, to the inside of roller 104 and

around the outside of rollers 105 and 106. The belt does not contact roller 103. Belt B6 is entwined identically to belt B5. However, the tensioning plate 132 is larger for belt B6, which is a longer belt than belt B5.

5 Belt B7, illustrated in Figure 10G, is the longest of the belts and is entwined under roller 107, over roller 102, around the inside of roller 103 and the outside of rollers 104, 105 and 106.

In the present invention, a plurality of fixed position festoon rollers 10 are utilized with tensioning plates of different dimensions to match different length belts. Referring again to Figure 7, the rocker arm 114 actuates an indexing device which is a ratchet arrangement which winds all the belts forward simultaneously a single pitch. The mechanism is indexed by a cam 142 around which the modified blanket cylinder rotates. The cam 15 142 actuates rod 114 which activates the entire assembly, allowing the index roller device to wind the belts one gradient, i.e., one pitch. The belts are synchronous with each other, that is, each belt moves forward one pitch position each cycle and are held in synchronization by the indexing roller.

20 Still referring to Figure 7, when the cam plate 142 moves in an counter clockwise direction, rocker arm 114 is moved upward and to the left (as when viewing the drawing) pushing rocker plate 115 upward. This, in turn, urges ratchet assembly 145 in a counter clockwise direction. The ratchet assembly urges spring bar 144 upward until it catches surface 147. 25 Spring bar 144 includes a spring means 143 which couples the spring bar to the housing 101. The ratchet assembly 145 is coupled to roller 102 so that as it advances, each of the flexographic belts is advanced one gradient.

In the preferred embodiment of the present invention, the belts include symbols, characters or numbers etched on repeated centers with drive pin holes staggered between numbers and on repeated centers. The belts are driven by a roller (102) with drive pins for each belt equally spaced 5 around its circumference. In the present invention, the ratchet mechanism advances the drive roller through one-fifth of a revolution.

In operation, the can decorating press takes ink from each of the four to six printing stations on a blanket, or in this case, under parts of the 10 imprinting cassette. The image is transferred to the can by having the can roll down the blanket, taking the image off, and eventually passing over the anvil and taking the random image off the printing cassette. The modified blanket cylinder goes through a 360° turn to get back to its original position. During that turn, the cam actuates the change of pitch, changing the next 15 increment of numbers of symbols to be printed on the can.

Thus, an improved method and apparatus for printing onto cylindrical objects has been described.

CLAIMS

1. A cassette unit for printing quasi random characters as part of a can decorate press comprising:

5 a housing having first and second sides;
 a plurality of festoon rollers coupled to said housing;
 a plurality of printing belts disposed about said festoon rollers, each of said plurality of belts of different length, each of said belts having gearing means disposed thereon for engagement with one of said festoon rollers;
10 each of said belts having a plurality of flexographic printing plates disposed on one side thereof at a predetermined pitch, each of said belts having a length which is a multiple of said predetermined pitch;
 a plurality of tensioning means coupled to said housing and receiving said printing belts for providing tension to said printing belts.

15

2. The cassette unit of claim 1 further including a ratchet mechanism coupled to said cassette unit for advancing at least one of said rollers, one pitch gradient each printing cycle.

20

3. The cassette unit of claim 2 wherein said ratchet mechanism comprises a cam plate coupled to a blanket cylinder of said can decorator press, an arm assembly coupled to said cam plate and a ratchet and pawl mechanism coupled to said one roller.

25

4. The cassette unit of claim 3 wherein said belts having lengths which are a prime multiple of said pitch gradient value.

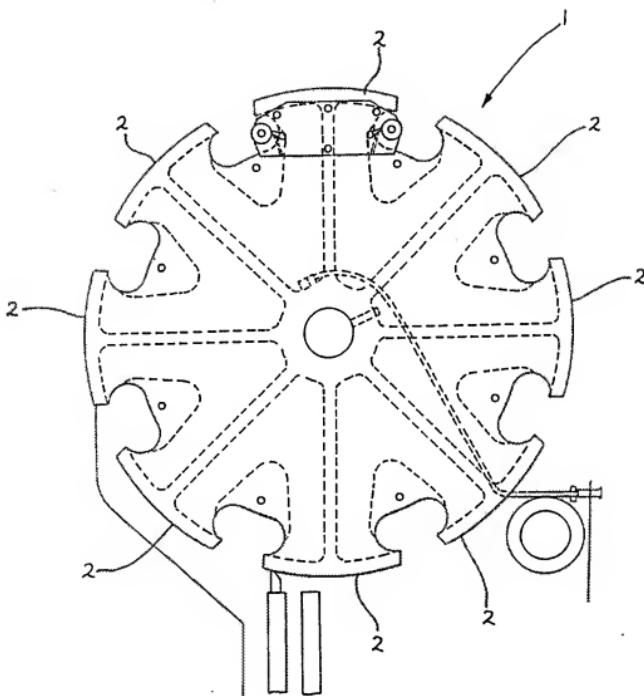
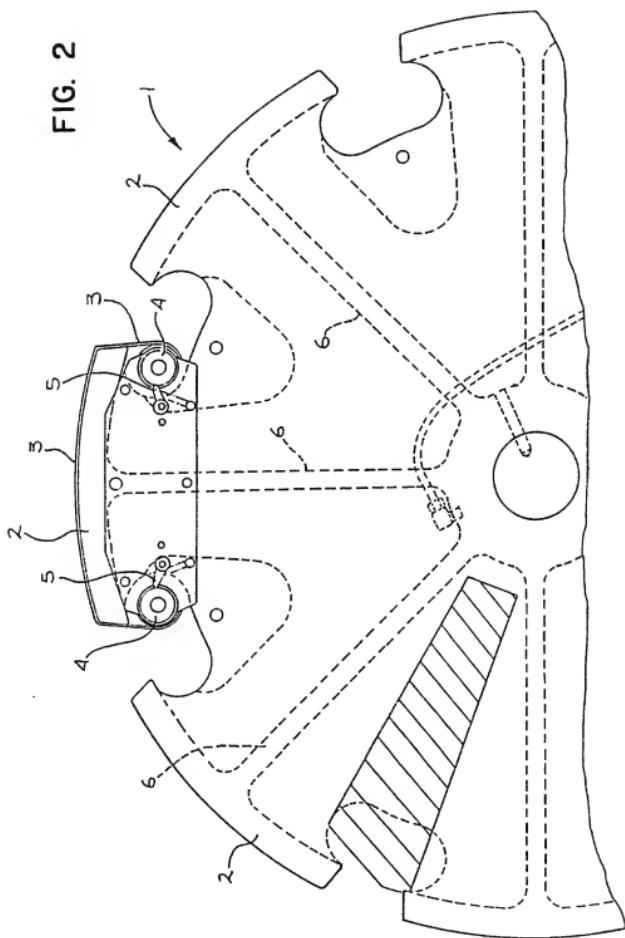


FIG. 1

FIG. 2



3: A

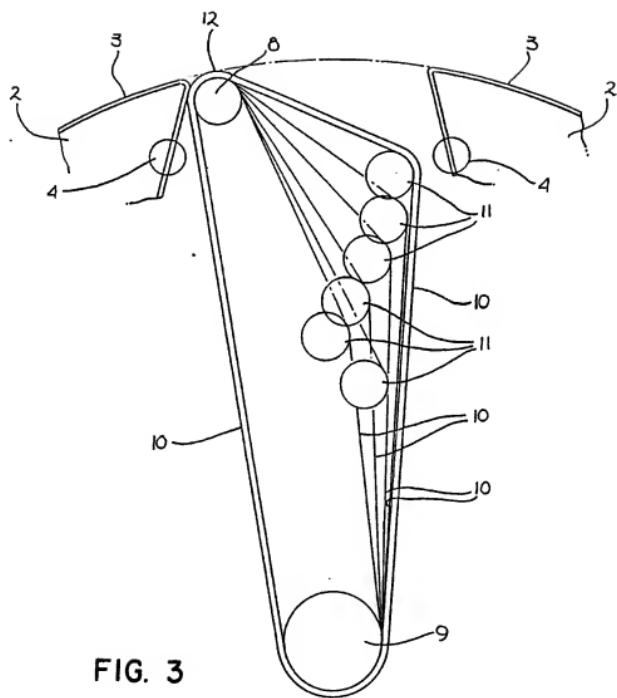


FIG. 3

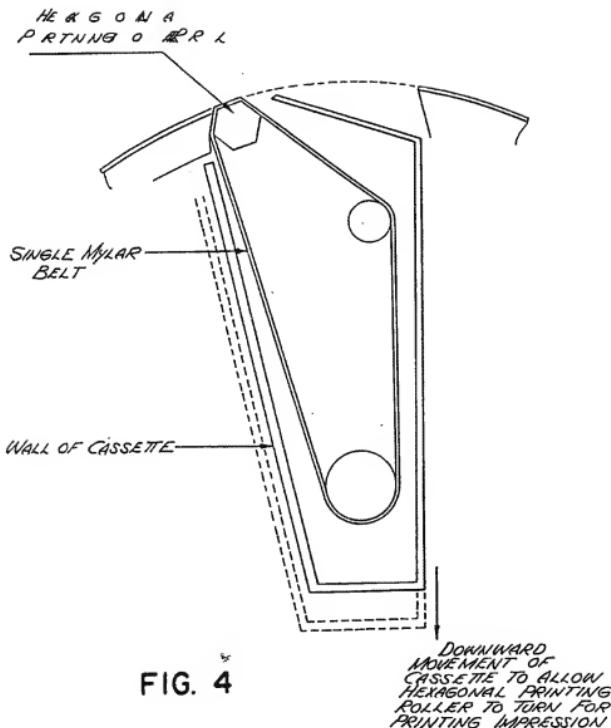


FIG. 4

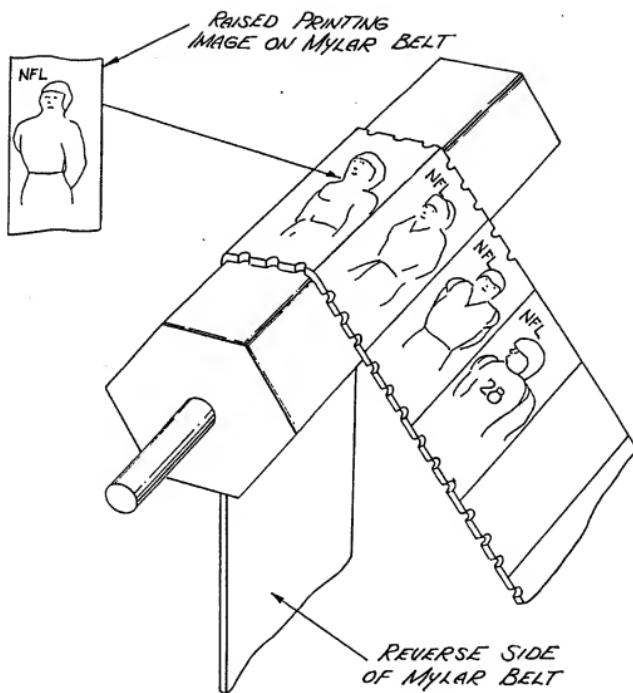


FIG. 5

6 / 12

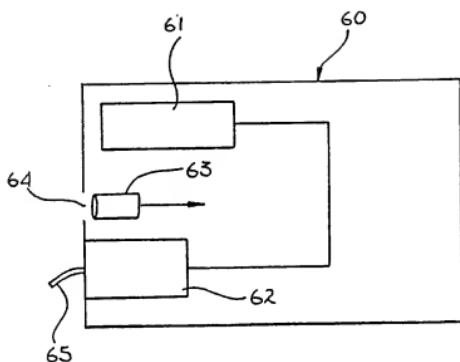
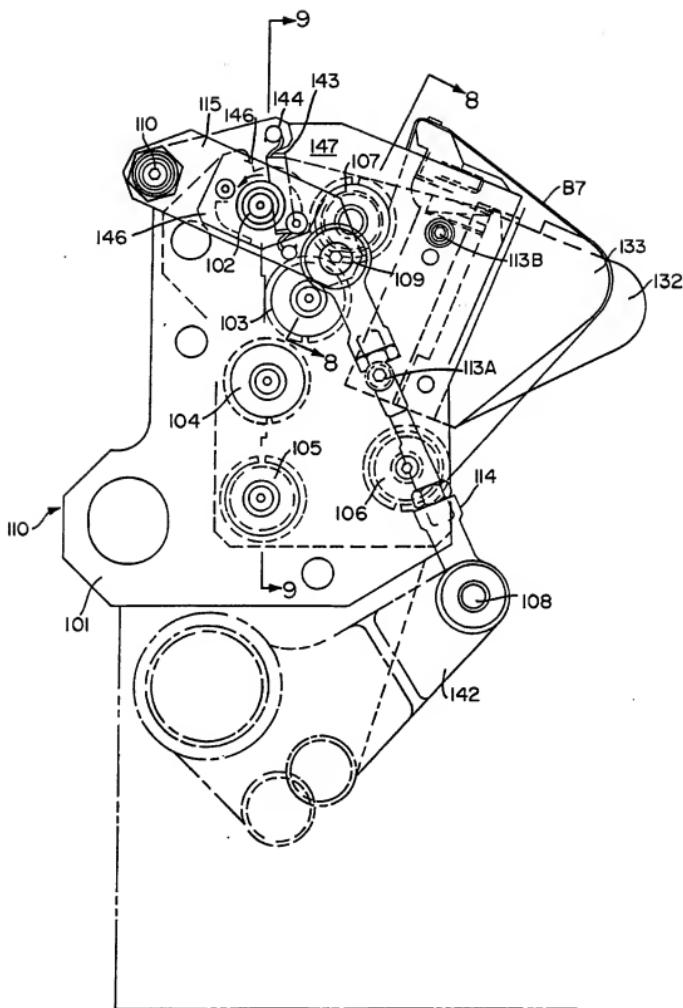


FIG. 6

7 / 12

F | G



8 / 12

FIG. 8

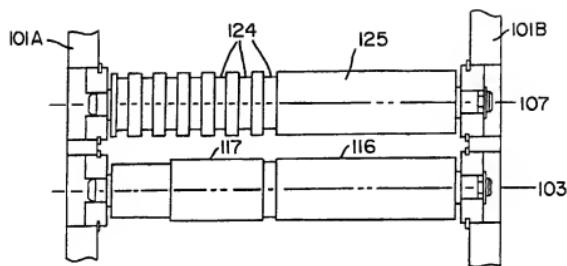


FIG. 9

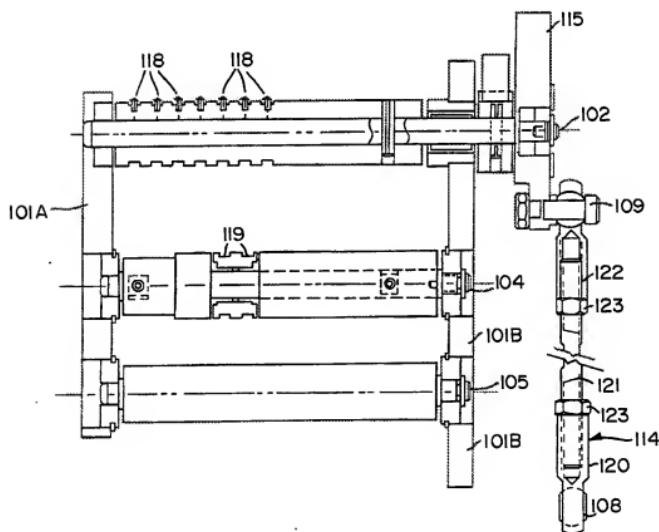


FIG. 10A

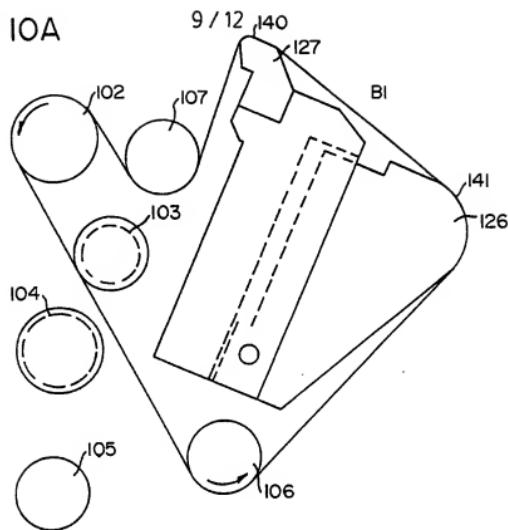


FIG. 10B

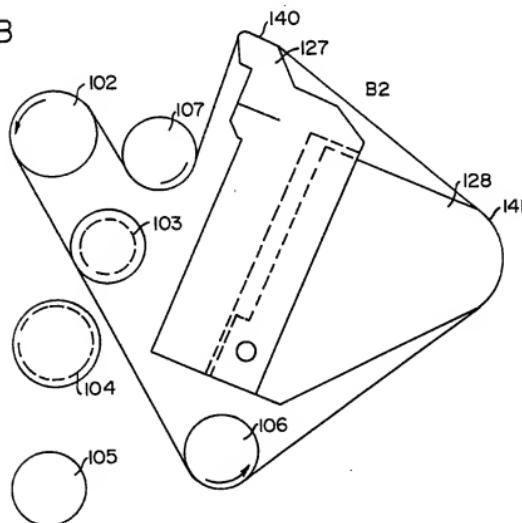


FIG. IOD

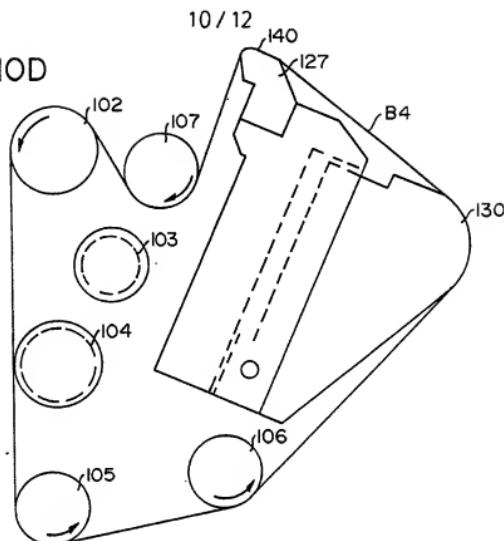


FIG. IOC

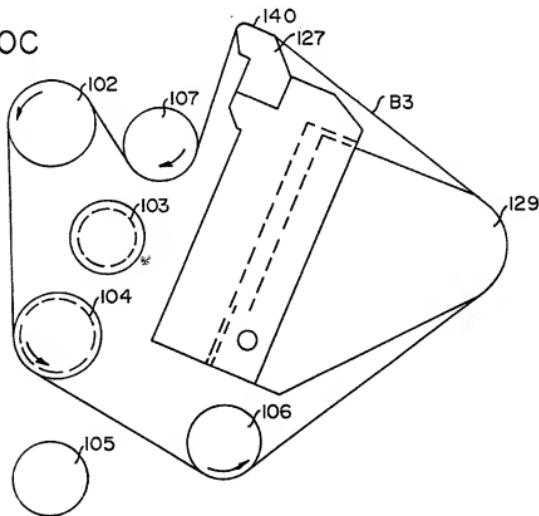


FIG. 10E

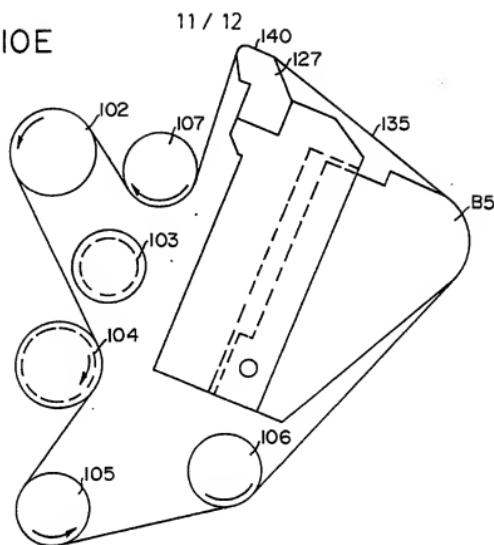


FIG. 10F

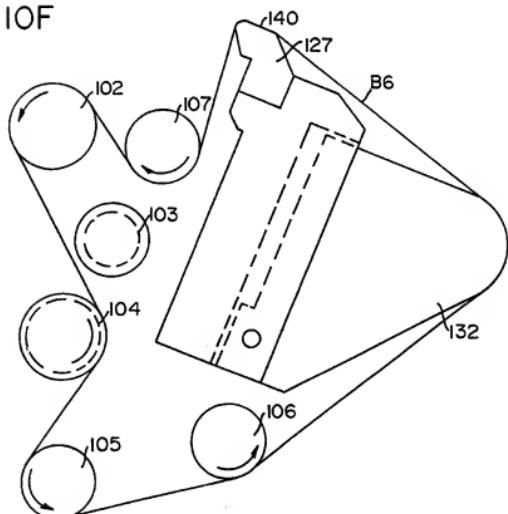
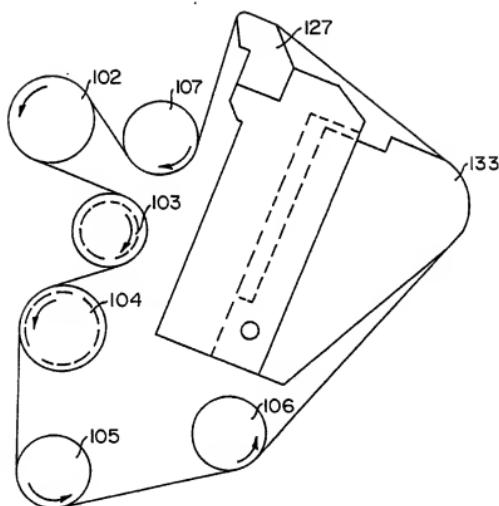


FIG. 10G



INTERNATIONAL SEARCH REPORT

International Application No. PCT/US90/07043

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all):

According to International Patent Classification (IPC) or to both National Classification and IPC
 IPC(5): B41F 17/22
 US CL.: 101/38.1

II. FIELDS SEARCHED

Classification System	Minimum Documentation Searched *	
		Classification Symbols
US	101/38.1, 39, 30, 30.1, 76, 84, 212	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *		

III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴

Category *	Citation of Document, ¹⁴ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁴
X, P	US, A, 4,884,504 (SILLARS) 05 December 1989 See col. 2 and 3.	1,2
Y	US, A, 3,348,478 (GANCARZ et al.) 24 October 1967 See Fig. 2 and col. 2, line 66 through col. 3, line 18.	3,4
A, P	US, A, 4,893,559 (SILLARS) 16 January 1990	
A	US, A, 4,541,333 (SILLARS) 17 September 1985	
A	US, A, 4,601,239 (SILLARS) 22 July 1986	
A	US, A, 3,521,554 (ZURICK) 21 July 1970	

* Special categories of cited documents: ¹³

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IV. CERTIFICATION

Date of the Actual Completion of the International Search ¹⁵	Date of Mailing of this International Search Report ¹⁶
03 JANUARY 1991	11 FEB 1991
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